Pneumonia in Adult Patients with Cancer

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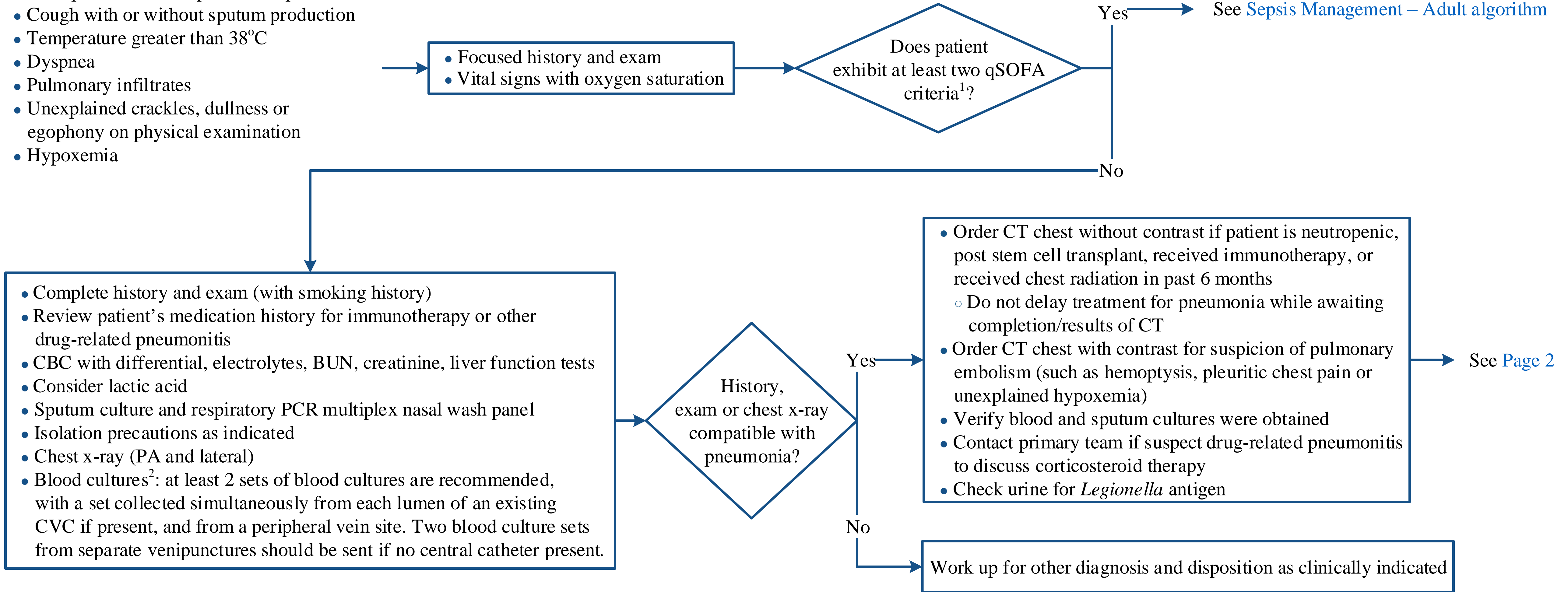

[1] qSOFA criteria
- Altered mental status
- Respiratory rate greater than or equal to 22 bpm
- Systolic blood pressure less than or equal to 100 mmHg

[2] Collect blood cultures prior to antibiotic administration

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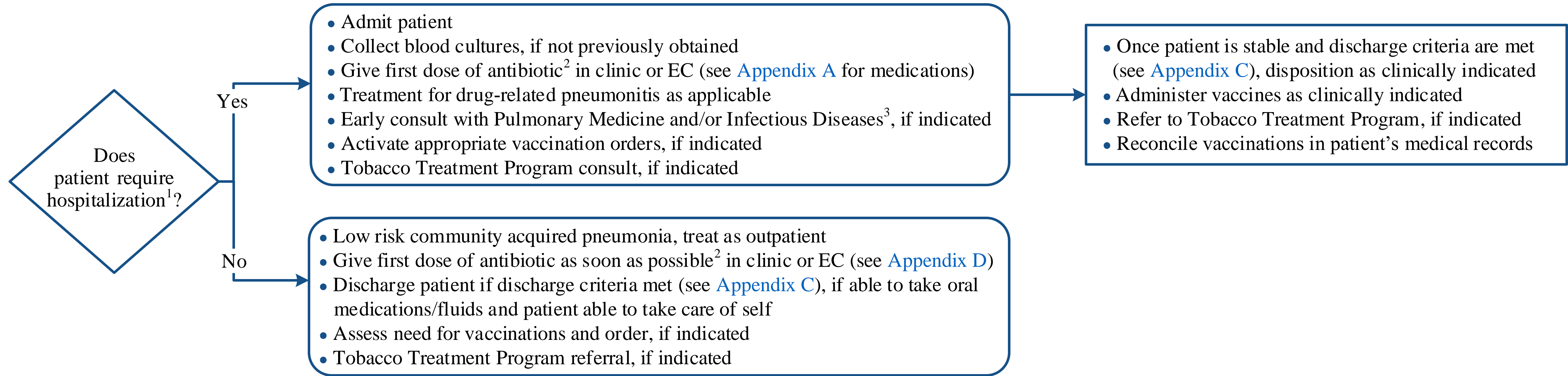

[1] Consider hospitalization if any of the following are present:
- Multidrug-Resistant Pathogen (MDRP) is suspected
  - Undergoing or recent history of chemotherapy/radiation therapy, immunotherapy or any cancer therapy
  - High frequency of antibiotic resistance in the community or specific hospital unit
  - Family member with MDRP
  - Hospitalization for 2 or more days within past 90 days
  - Chronic dialysis within the last 30 days
  - Antibiotics within past 90 days
  - Residence in a nursing home or extended care facility
  - Home wound care or home infusion therapy (including antibiotics)
- Neutropenia (ANC less than 1 K/microliter)
- Stem cell transplant or leukemia patient
- Radiation therapy to chest within past 4 weeks
- Pneumonia/Community Acquired Pneumonia (CAP) with PSI higher than 2 (Appendix B)

[2] The goal is to give the antibiotics as soon as possible, preferably within 2 hours of evaluation and diagnosis

[3] Consultation should be considered in, but is not limited to, the following clinical scenarios
- Pulmonary Medicine and Infectious Diseases
  - Bilateral ground glass opacities on CT chest suspicious for viral pneumonia (interstitial pneumonia in the setting of seasonal activity of community respiratory viruses), *Pneumocystis (carinii) jiroveci* (interstitial pneumonia in the setting of steroid tapering), or interstitial pneumonitis
  - Cavities or nodules on CT suspicious for fungal infection
- Pulmonary Medicine
  - Respiratory insufficiency
- Infectious Diseases
  - Early re-admission or recent bacteremia
  - Multiple antibiotic allergies
  - Known colonization by MDRP

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APPENDIX A: Antimicrobial Therapy Recommendations

Note: Adjust doses for patients with renal/hepatic dysfunction; gram-negative coverage antibiotics should be given first

For patients with risk factors for MDRP:
Choose:

- Cefepime[1,2] 2 grams IV every 8 hours
- For suspected aspiration or post-obstructive pneumonia
  - Add metronidazole 500 mg IV or orally[3] every 8 hours to cefepime **or** use piperacillin/tazobactam 4.5 grams IV every 6 hours instead of cefepime

Plus one of the following:

- Ciprofloxacin 400 mg IV every 8 hours or 750 mg orally every 12 hours only if no quinolone prophylaxis **or**
- Levofloxacin 750 mg IV or orally every 24 hours only if no quinolone prophylaxis **or**
- Azithromycin 500 mg IV or orally every 24 hours

Plus one of the following:

- Linezolid 600 mg IV or orally every 12 hours **or**
- Vancomycin 15 mg/kg (round to nearest 250 mg dose) IV every 12 hours

For patients receiving immunotherapy:

- Discuss starting corticosteroid therapy with primary team

For Community Acquired Pneumonia (patients with no risk factors for MDRP, in long-term cancer survivors) with planned admission to general floor, choose **one** of the following options:

- Ceftriaxone 2 grams IV every 24 hours **and** azithromycin 500 mg IV or orally every 24 hours
- Ceftriaxone 2 grams IV every 24 hours **and** doxycycline 100 mg IV or orally every 12 hours (if intolerant of macrolides)
- Levofloxacin 750 mg IV or orally every 24 hours
- Moxifloxacin 400 mg IV or orally every 24 hours
- For suspected aspiration or post-obstructive pneumonia[3]
  - Ampicillin/sulbactam 3 grams IV every 8 hours **and** azithromycin 500 mg IV or orally every 24 hours
  - Ampicillin/sulbactam 3 grams IV every 8 hours **and** doxycycline 100 mg IV or orally every 12 hours (if intolerant of macrolides)
  - Clindamycin 300 mg orally every 6 hours **and** ciprofloxacin 750 mg orally every 12 hours (for penicillin IgE-mediated allergic patients able to tolerate oral medications)
  - Clindamycin 600 mg IV every 8 hours **and** ciprofloxacin 400 mg IV every 8 hours (for penicillin IgE-mediated allergic patients unable to tolerate oral medications)

[1] Consider meropenem if patient has any of the following:

- Non-IgE-mediated allergy to alternative beta-lactam agents
- Recent treatment (of at least 3 days duration) with cefepime or piperacillin/tazobactam within past 30 days
- Infection with ESBL organism or any history of ESBL in culture
- Infection with organism only susceptible to carbapenem

[2] For IgE-mediated allergy to penicillin, use aztreonam 2 grams IV every 8 hours instead of cefepime

[3] Oral regimen may be appropriate for post-obstructive pneumonia or if aspiration has resolved

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APPENDIX A: Antimicrobial Therapy Recommendations - continued

Note: Adjust doses for patients with renal/hepatic dysfunction; gram negative coverage antibiotics should be given first

For multi-drug resistant *Pseudomonas aeuriginosa* or carbapenem-resistant enterobacteriaceae (CRE) − consult Infectious Diseases

For *Stenotrophomonas maltophilia*

- Sulfamethoxazole/trimethoprim (TMP) 15 mg/kg/day divided every 6-8 hours IV or orally
- If sulfa allergy,
  - Minocycline 200 mg IV or orally for one dose, then 100 mg IV or orally every 12 hours **or**
  - Ceftazidime 2 grams IV every 8 hours
- Consult Infectious Diseases

For influenza

- Oseltamivir 75 mg orally twice daily for five days and consider consult to Infectious Diseases

For suspected or known fungal etiology

- Consult Infectious Diseases and Pulmonary Medicine
- For hematologic malignancy patients, check serum for *Aspergillus* antigen (galactomannan); if positive, repeat to confirm
- Order CT chest without contrast if not already performed

For suspected or known *Pneumocystis (carinii) jiroveci* pneumonia

- Not acutely ill, able to take oral medications, and PaO_2 greater than 70
  - Start sulfamethoxazole/trimethoprim 15 mg/kg/day divided every 6-8 hours IV or orally (for sulfa allergy, may use clindamycin plus either primaquine or atovaquone)
  - Consider Infectious Diseases and Pulmonary Medicine consults
  - Check serum for fungitell (beta-D-glucan)
- Acutely ill, unable to take oral medications, and hypoxemic
  - Start sulfamethoxazole/trimethoprim 5 mg/kg IV every 8 hours (for sulfa allergy, may use clindamycin IV plus either primaquine or pentamidine IV)
  - Obtain Infectious Diseases and Pulmonary Medicine consults
  - Check serum for fungitell (beta-D-glucan)

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APPENDIX B: Pneumonia Severity Index (PSI)[1,2]

To obtain a total score for a given patient: add the patient's age in years (age minus 10 for women) plus the points for each applicable characteristic

Characteristic	Points
• Nursing home resident	+10
• Coexisting illnesses[3]	
○ Neoplastic disease	+30
○ Liver disease	+20
○ Congestive heart failure	+10
○ Cerebrovascular disease	+10
○ Renal disease	+10
• Laboratory and radiographic findings	
○ Arterial pH less than 7.35	+30
○ BUN greater than or equal to 30 mg/dL	+20
○ Sodium less than 130 mEq/liter	+20
○ Glucose greater than or equal to 250 mg/dL	+10
○ Hematocrit less than 30%	+10
○ Partial pressure of arterial oxygen less than 60 mmHg	+10
○ Pleural effusion	+10
• Physical-examination findings	
○ Altered mental status[4]	+20
○ Respiratory rate greater than or equal to 30 breaths per minute	+20
○ Systolic blood pressure less than 90 mmHg	+20
○ Temperature less than 35°C or greater than or equal to 40°C	+15
○ Pulse greater than or equal to 125 beats per minute	+10

[1] The use of this score is to facilitate site of care decisions for those patients that are classified as community acquired pneumonia and have not been validated (requires prospective validation) for pneumonia caused by suspected MDRP or immunocompromised population that are the majority of patients seen at MDACC. This guideline is not meant to replace clinical judgment.

[2] The Pneumonia Severity Index may be found on the MDACC Intranet under Clinic Portal – Clinical Calculators

	PSI Risk Score Interpretation	Mortality
I	Absence of all predictors: • Age less than 50 years **and** • No neoplastic disease, congestive heart failure, cerebrovascular disease, renal disease, liver disease, **and** • No abnormalities on physical exam including: ○ Altered mental status ○ Pulse greater than or equal to 125 beats per minute ○ Respiratory rate greater than or equal to 30 breaths per minute ○ Systolic blood pressure less than 90 mmHg ○ Temperature less than 35°C or greater than or equal to 40°C	0.1%
II	Less than or equal to score of 70	0.6%
III	71 – 90	0.9%
IV	91 – 130	9.3%
V	Greater than 130	27%

From "A prediction rule to identify low-risk patients with community-acquired pneumonia.," by M. J. Fine, T. E. Auble, D. M. Yealy, B. H. Hanusa, L. A. Weissfeld. D. E. Singer,… W. N. Kapoor, 1997, *N Engl J Med, 336*, p. 243-250. Copyright 1997 Massachusetts Medical Society. Adapted with permission.

[3] Coexisting illness definitions:
- Neoplastic disease – any cancer except basal- or squamous-cell cancer of the skin that was active at the time of presentation or diagnosed within one year of presentation
- Liver disease – a clinical or histologic diagnosis of cirrhosis or another form of chronic liver disease, such as chronic active hepatitis
- Congestive heart failure – a systolic or diastolic ventricular dysfunction documented by history, physical examination, chest x-ray, echocardiogram, multiple gated acquisition scan, or left ventriculogram
- Cerebrovascular disease – a clinical diagnosis of stroke or transient ischemic attack/stroke documented by MRI or CT
- Renal disease – a history of chronic renal disease or abnormal BUN and creatinine concentrations documented in the medical record

[4] Altered mental status is defined as disorientation with respect to person, place, or time that is not known to be chronic stupor or coma

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APPENDIX C: Discharge Criteria

- Temperature less than 37.8°C
- Pulse less than 100 beats per minute
- Systolic blood pressure greater than 90 mmHg
- Blood oxygenation greater than 90%
- Able to maintain oral intake

APPENDIX D: Outpatient Antibiotic Regimen for CAP

- Preferred regimen
  - Amoxicillin/clavulanate (2,000/125 mg orally twice daily **or** 875/125 mg orally three times a day) **and**
  - Azithromycin (500 mg orally once, then 250 mg orally daily thereafter)
- Alternative regimen if intolerant of macrolides
  - Amoxicillin/clavulanate (2,000/125 mg orally twice daily **or** 875/125 mg orally three times a day) **and**
  - Doxycycline 100 mg orally every 12 hours
- Alternative regimen for IgE-mediated allergy to penicillin
  - Levofloxacin 750 mg orally every 24 hours **or**
  - Moxifloxacin 400 mg orally every 24 hours

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